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EXAMINER

CHEN, CHONGSHAN

ART UNIT PAPER NUMBER

2162

DATE MAILED: 02/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/842,991

Applicant(s)

LUO ET AL.

Examiner

Chongshan Chen

Art Unit

2162

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 01 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 13-24 and 33-35 is/are rejected.
- 7) ☒ Claim(s) 5-12 and 25-32 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- 1) ☐ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### DETAILED ACTION

1. This action is responsive to communication filed on 1 November 2004. Examiner withdrew the finality of the last Office Action. Claims 1-35 are pending in this Office Action.

#### *Double Patenting*

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claims 1-12, 33 and 34 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,804,678 B1.

Although the conflicting claims are not identical, they are not patentably distinct from each other because of following reasons: Claim 1 of the instant application substantially recites the limitation of claim 1 of the cited U.S. patent. The claim merely omits certain the underlined limitations and replaces the bolded limitations as shown in comparison table 1 below.

Application Claim 1	U.S. Patent 6,804,678 B1 Claim 1
1. A method comprising:  storing first tuples in a first table in a	1. A method comprising:  storing first tuples in a first table in a

<p>database system;</p> <p>storing second tuples in a second table in the database system;</p> <p>partitioning the first and second tuples into plural portions;</p> <p><b>redistributing the first and second tuples to plural nodes according to the partitioning; and</b></p> <p><b>hash</b> joining the first and second tuples to produce result tuples as the first and second tuples are being redistributed to the plural nodes.</p>	<p>database system;</p> <p>storing second tuples in a second table in the database system;</p> <p>partitioning the first and second tuples into plural portions <u>distributed among plural nodes of the database system based on split vectors containing redefined ranges</u>; and</p> <p>joining the first and second tuples based on the partitioned portions.</p>
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Table 1

It would have been obvious to one of ordinary skill in the art of data processing at the time the invention was made to modify the cited steps as indicated claim 1 of the US Patent since the omission and addition of the cited limitations would have not changed the process according to which the method of joining the first and second tuples. Therefore, the ordinary skilled artisan would have been also motivated to modify claim 1 of the cited US patent by deleting the use of split vectors for distributing the tuples and adding the use of hash joining. Furthermore, the cited US patent discloses a non-blocking join algorithm that produces result tuples as the first and second tuples are being distributed to the plural nodes ('678 patent, col. 4, lines 35-50). The cited omitting elements would not interfere with the functionality of the steps previously claimed and would perform the same function. In re Karlson, 136 USPQ 184 (CCPA 1963).

The dependent claims 2-12, 33 and 34 of the instant application are rejected for fully incorporating the errors of their respective base claims by dependency.

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4. Claims 13-22 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,804,678 B1. Although the conflicting claims are not identical, they are not patentably distinct from each other because of following reasons: Claim 13 of the instant application substantially recites the limitation of claim 1 of the cited U.S. patent. The claim merely omits certain the underlined limitations and replaces the bolded limitations as shown in comparison table 2 below.

Application Claim 13	U.S. Patent 6,804,678 B1 Claim 1
<p>13. A database system comprising:  a plurality of nodes; and  instructions for enabling the database system to:  store first tuples in a first table distributed across the plurality of nodes;  store second tuples in a second table distributed across the plurality of nodes;  partition the first and second tuples into plural portions;  <b>redistributing the first and second tuples to the plurality of nodes according to the partitioning; and</b>  <b>hash</b> join the first and second tuples to produce result tuples as the first and second tuples are being redistributed to the plurality of nodes.</p>	<p>1. A method comprising:    storing first tuples in a first table in a database system;    storing second tuples in a second table in the database system;    partitioning the first and second tuples into plural portions <u>distributed among plural nodes of the database system based on split vectors containing redefined ranges</u>; and    joining the first and second tuples based on the partitioned portions.</p>

Table 2

It would have been obvious to one of ordinary skill in the art of data processing at the time the invention was made to modify the cited steps as indicated claim 1 of the US Patent since the omission and addition of the cited limitations would have not changed the process according to which the method of joining the first and second tuples. Therefore, the ordinary skilled artisan

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would have been also motivated to modify claim 1 of the cited US patent by deleting the use of split vectors for distributing the tuples and adding the use of hash joining. Furthermore, the cited US patent discloses a non-blocking join algorithm that produces result tuples as the first and second tuples are being distributed to the plural nodes ('678 patent, col. 4, lines 35-50). The cited omitting elements would not interfere with the functionality of the steps previously claimed and would perform the same function. In re Karlson, 136 USPQ 184 (CCPA 1963).

The dependent claims 14-22 of the instant application are rejected for fully incorporating the errors of their respective base claims by dependency.

5. Claims 23-32 and 35 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,804,678 B1.

Although the conflicting claims are not identical, they are not patentably distinct from each other because of following reasons: Claim 23 of the instant application substantially recites the limitation of claim 1 of the cited U.S. patent. The claim merely omits certain the underlined limitations and replaces the bolded limitations as shown in comparison table 3 below.

Application Claim 23	U.S. Patent 6,804,678 B1 Claim 1
23. An article comprising a medium storing instructions for enabling a processor-based system to: store first tuples in a first table in a database system; store second tuples in a second table in the database system; partition the first and second tuples into plural portions; <b>redistribute the first and second tuples to</b>	1. A method comprising: storing first tuples in a first table in a database system; storing second tuples in a second table in the database system; partitioning the first and second tuples into plural portions <u>distributed among plural nodes</u>

<b>plural nodes of the database system according to the partitioning; and</b> hash join the first and second tuples to produce result tuples as the first and second tuples are being redistributed to the plural nodes.	<u>of the database system based on split vectors containing redefined ranges; and</u>  joining the first and second tuples based on the partitioned portions.
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**Table 3**

It would have been obvious to one of ordinary skill in the art of data processing at the time the invention was made to modify the cited steps as indicated claim 1 of the US Patent since the omission and addition of the cited limitations would have not changed the process according to which the method of joining the first and second tuples. Therefore, the ordinary skilled artisan would have been also motivated to modify claim 1 of the cited US patent by deleting the use of split vectors for distributing the tuples and adding the use of hash joining. Furthermore, the cited US patent discloses a non-blocking join algorithm that produces result tuples as the first and second tuples are being distributed to the plural nodes ('678 patent, col. 4, lines 35-50). The cited omitting elements would not interfere with the functionality of the steps previously claimed and would perform the same function. In re Karlson, 136 USPQ 184 (CCPA 1963).

The dependent claims 24-32 and 35 of the instant application are rejected for fully incorporating the errors of their respective base claims by dependency.

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-4, 13-24 and 33-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agrawal et al. (hereinafter "Agrawal", 5,884,320) in view of Urhan et al. (hereinafter "Urhan", "Xjoin: Getting Fast Answers From Slow and Bursty Networks", Technical Report, CS-TR-3994, UMIACS-TR-99-13, February 1999).

As per claim 1, Agrawal discloses a method comprising:

storing first tuples in a first table in a database system (Agrawal, Fig. 1, element 10 and 12);

storing second tuples in a second table in the database system (Agrawal, Fig. 1, element 10 and 12, Fig. 2, Fig. 2 shows a distributed system with plurality of processors and databases, each database 10 has a database and tuples stored in it);

partitioning the first and second tuples into plural portions (Agrawal, Fig. 3, element 32, col. 5, lines 64-67);

redistributing the first and second tuples to plural nodes according to the partitioning (Agrawal, Fig. 3, element 38, col. 6, lines 11-15); and

joining the first and second tuples to produce result tuples as the first and second tuples are being redistributed to the plural nodes (Agrawal, Fig. 3, element 38, col. 6, lines 11-15).

Agrawal teaches performing the join operation. However, Agrawal does not explicitly disclose the join operation performed is a hash join. Urhan teaches the hash join operation (Urhan, page 3-6). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the join method of Agrawal by incorporating the hash



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join as disclosed by Urhan (Urhan, page 3-6). The motivation being to improve the processing speed because the system can use hash key to find data instead of compare data one by one.

As per claim 2, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 1, and further teach retrieving the result tuples once the hash join is performed (Urhan, page 2-6).

As per claim 3, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 1, and further teach retrieving the result tuples at random (Urhan, page 2-6).

As per claim 4, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 1, and further teach producing result tuples at one of the plural nodes; and simultaneously producing result tuples at a second of the plural nodes (Urhan, page 2-6).

Claims 13-15 are rejected on grounds corresponding to the reasons given above for claims 1-3.

As per claim 16, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 13, and further teach partitioning first tuples into first hash tables; and partitioning second tuples into second hash tables, wherein the hash tables are in the memory (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 17, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 16, and further teach allocate a portion of the memory to the first hash table; allocate a second portion of the memory to the second hash table; and hash join first tuples in the first hash table with second tuples in the second hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 18, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 17, and further teach determining that the portion of the memory allocated to the first hash table is full; and storing first tuples in a stable storage (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 19, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 18, and further teach continuing to store second tuples in the second hash table; and hash join second tuples in the second hash table with first tuples in the first hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 20, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 19, and further teach determine that the second portion of the memory allocated to the second hash table is full; allocate a second stable storage to the second hash table; store second tuples in the second stable storage; and hash join second tuples in the second stable storage with first tuples in the first hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 21, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 20, and further teach generate a third hash table once all first tuples and second tuples are redistributed to each node; retrieve one of the first tuples from the stable storage; hash join the one of the first tuples with tuples in the second hash table; and store the one of the first tuples in the third hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 22, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 21, and further teach retrieve one of the second tuples from the second stable storage; and hash join the one of the second tuples with tuples in the third hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

Claims 23-24 are rejected on grounds corresponding to the reasons given above for claims 1-2.

As per claim 33, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 1, and further teach wherein storing the first tuples in the first table comprises distributing the first tuples across the plural nodes of the database system, and wherein storing the second tuples in the second table comprises distributing the tuples across the plural nodes (Agrawal, Fig. 1 & 2).

As per claim 34, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 33, and further teach redistributing the first and second tuples comprises redistributing the first and second tuples to the plural nodes of the database system (Agrawal, Fig. 1 & 2).

As per claim 35, Agrawal and Urhan teach all the claimed subject matters as discussed in claim 23, and further teach storing the first tuples in the first table comprises storing the first tuples in the first table distributed across the plural nodes of the database system, and wherein storing the second tuples in the second table comprises storing the second tuples distributed across the plural nodes of the database system (Agrawal, Fig. 1 & 2).

#### ***Allowable Subject Matter***

8. Claims 5-12 and 25-32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

As to claims 5 and 25, the feature of redistribute based on split vectors containing predefined ranges, taken together with other limitations of claim 1-4 and 23-24 respectively was not disclosed by the prior art of record.

### ***Conclusion***

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Leung et al. (US 6,625,593 B1) disclose a parallel query optimization strategies for replicated and partitioned tables.

Andrei (US 6,618,719 B1) discloses a database system with methodology for reusing cost-based optimization decisions.

Ponnekanti (US 6,493,701 B2) disclose a database system with methodology providing faster N-ary nested loop joins.

Mumick et al. (US 6484159 B1) disclose a method and system for incremental database maintenance.

Leymann et al. (US 6415297 B1) disclose a parallel database support for workflow management systems.

Lindsay et al. (US 6226639 B1) disclose a system and method for hybrid hash join using over-partitioning to respond to database query.

Al-omari et al. (US 6205441 B1) disclose a system and method for reducing compile time in a top down rule based system using rule heuristics based upon the predicted resulting data flow.

Lohman et al. (US 6112198 A) disclose optimization of data repartitioning during parallel query optimization.

Cochrane et al. (US 6081801 A) disclose shared nothing parallel execution of procedural constructs in SQL.

Srivastava et al. (US 6061676 A) disclose effecting constraint magic rewriting on a query with the multiset version of the relational algebraic theta-semijoin operator.

Srivastava et al. (US 6032144 A) disclose optimization of queries using relational algebraic theta-semijoin operator.

Agrawal et al. (US 5832475 A) disclose a database system and method employing data cube operator for group-by operations.

Vijaykumar (US 5745896 A) discloses referential integrity in a relational database management system.

Cheng et al. (US 5557791 A) disclose outer join operations using responsibility regions assigned to inner tables in a relational database.

M. Cheng et al. (US 5551031 A) disclose program storage device and computer program product for outer join operations using responsibility regions assigned to inner tables in a relational database.

Agrawal et al. (US 4930072 A) disclose method for computing transitive closure.

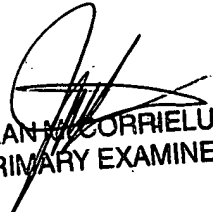
***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chongshan Chen whose telephone number is (571)272-4031. The examiner can normally be reached on Monday - Friday (8:00 am - 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E Breene can be reached on (571)272-4107. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chongshan Chen  
February 17, 2005

  
JEAN M. CORRIELLUS  
PRIMARY EXAMINER